UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/737,393	12/16/2003	Kenichi Morimoto	A-468	5877

802 7590 07/16/2007
PATENTTM.US
P. O. BOX 82788
PORTLAND, OR 97282-0788

EXAMINER	
OLSEN, ALLAN W	
ART UNIT	PAPER NUMBER
1763	
MAIL DATE	DELIVERY MODE
07/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/737,393	MORIMOTO, KENICHI	
	Examiner	Art Unit	
	Allan Olsen	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claims 1-4 and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As presented in applicant's response of June 14, 2006, Claim 1 recites:

> 1. (currently amended) A mask blank used for the charged particle beam exposure, which is made by employing an SOI substrate having a front-side silicon membrane and a back-side silicon layer with a silicon oxide film having a first internal stress interposed therebetween, wherein the back-side silicon layer of said SOI substrate and the silicon oxide film are partially removed to form an opening to be an exposed region and an etching stop layer having lower internal stress than said first internal stress is formed in the opening.

The claim requires removing a portion of a silicon oxide film and providing in place thereof an etch stop material wherein the etch stop material is required to have a lower internal stress than that of the replaced silicon oxide.

In this regard, at page 11, line 18 to page 12, line 4, applicant's specification states:

> The etching stop layer 7 used in the present invention functions as an etching stop layer during the dry-etching of the front-side silicon membrane 2. The etching stop layer 7 is made of a material which provides a lower internal stress to the etching stop layer 7 after formed, i.e. one selected from a group consisting of Cr, Ti, Ta, Mo, W, and Zr and nitrides, oxides, and oxynitrides of these metals.
>
> The internal stress of the etching stop layer 7 for preventing the deformation of the silicon membrane 2 is preferably in a range from -I0 MPa to +I0 MPa. Minus "-" represents the compression stress and plus "+" represents the tensile stress.

> The thickness of the etching stop layer 7 is in order of 100 nm to 1 μm and can be formed by way of sputtering technique or CVD technique so as to control its stress.

With regard to providing a material with a lower internal stress, the specification fails to provide a disclosure that is sufficient to enable one skilled in the art to practice this aspect of the invention.

Claim Rejections - 35 USC § 102

The following rejections are made in the alternative under 102/103. The circumstance under which such a rejection is appropriate may include:

a. *When the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention but has basis for shifting the burden of proof to applicant as in In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). See MPEP § § 2112- 2112.02.*

b. *When the reference teaches a product that appears to be the same as, or an obvious variant of, the product set forth in a product-by-process claim although produced by a different process. See In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) and In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP § 2113.*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

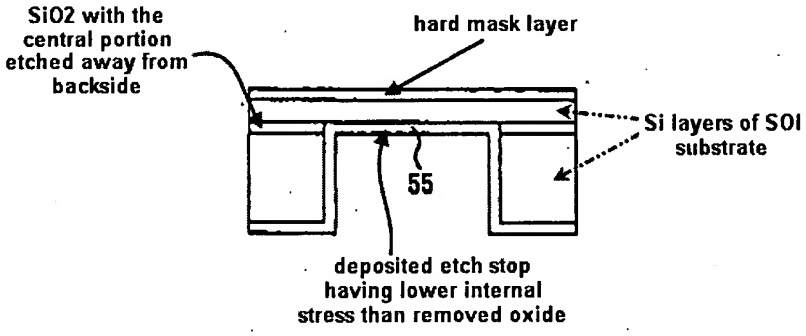
> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4 and 10 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over EP 1 065 566 issued to Hoya Corporation (hereinafter, Hoya).

As shown by the following annotation of Hoya's figure 15E, Hoya teaches a structure that corresponds to the mask blank of claim 1.



Hoya teaches that the hard mask layer and the etch stop may be TiN (see: [0079], [0139], [0247]). In the following excerpt, the "electron beam scattering body" corresponds to the claimed hard mask layer and the "pattern supporting layer" corresponds to the claimed deposited etch stop. Hoya teaches forming the claimed structure using the same material and same deposition processes as applicant. As such, the magnitude of the internal stress is expected to be the same.

[0246] Although the present invention has been described by enumerating its several embodiments, it should not be limited to the scopes of the invention. In the Embodiments 1 to 8, for example, the step order should not be especially limited if it can satisfy the mask structure of the final target. On the other hand, the etching mask may be made of any material including an organic material such as a resist, an inorganic material such as SiO_2 or a metallic material.
[0247] Moreover, the electron beam scattering body material or the pattern supporting layer material may be any if it satisfies the mask characteristics of the present invention. This material can be exemplified by not only the aforementioned ones but also a chemical semiconductor material such as boron nitride (BNx), carbon nitride (CNx), titanium nitride (TINx), Indium phosphide (InP) or gallium nitride (GaNx). In addition, there can be used any material including a silicide such as titanium silicide (TiSix), a carbide such as titanium carbide (TiC) or a boride such as B-doped Si (111) or TIBx, if it satisfies the required characteristics such as the chemical resistance, the etching workability or the film forming property. The etching stopper layer can be exemplified by not only the aforementioned ones but also Si, Ti, TiCNx or TiSix.

Response to Arguments

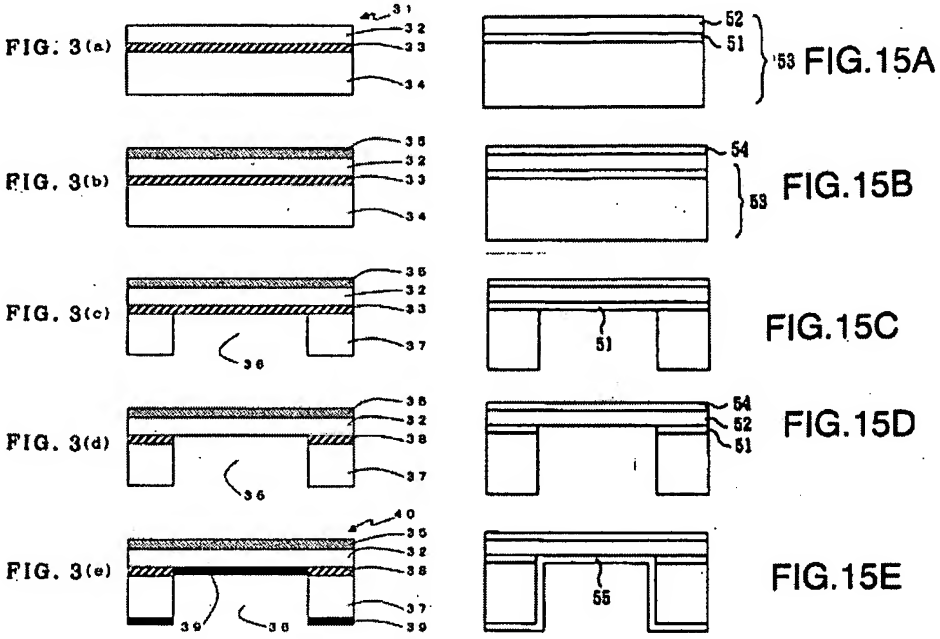
Regarding Hoya, applicant argues:

> The Examiner seems to assert that, in the blank of the cited EP 1065566 (FIG 15E), the pattern supporting layer 55 corresponds to the etching stop layer 39 of the present invention and also that EP 1065566 discloses that the pattern supporting layer 55 is TiN, which is the same material as found in Claims of the present invention. Therefore, it is concluded, both inventions have the same stress. Applicant respectfully traverses.
>
> The fact that the same material is used, does not necessarily mean the stress is also the same.
>
> Stress is not a physical property determined by a material, but changes depending on a structure including the layer and a manufacturing method thereof. In fact, stress can be controlled by a manufacturing method, and for this reason, Cr layer of a photo-mask, for example, is put into practice (without having the under layer Qz distorted).
>
> Applicant respectfully submits that the pattern supporting layer 55 of the cited EP 1065566 has strong pulling stress (stress of the layer itself trying to contract). This is because the pattern supporting layer 55 of the EP 1065566 is not removed in the process of manufacturing a mask, and is a layer for supporting scatterer (pattern). Therefore, at a stage of the blank, the layer 55 is considered to be in a tense state, that is, a state of pulling stress.
>
> On the other hand, the etching stop layer (39) of the present invention is removed in the process of manufacturing the mask (FIG 4) and is not a supporting member of the mask pattern (42). Therefore, there is no problem if the etching stop layer has lower internal stress than the silicon oxide film (33). The etching stop layer having lower stress instead is to be used so that the silicon thin film layer is not deformed.
>
> Since in view of the above, the cited EP 1065566 does not disclose "the etching stop layer having 'lower stress' than the stress of the silicon oxide film" which is a configuration of the present claims, it is respectfully submitted that the claims should be allowable.

Regarding applicant's argument, the examiner does not understand, in particular, the following aspect:

> This is because the pattern supporting layer 55 of the EP 1065566 is not removed in the process of manufacturing a mask, and is a layer for supporting scatterer (pattern). Therefore, at a stage of the blank, the layer 55 is considered to be in a tense state, that is, a state of pulling stress.
>
> On the other hand, the etching stop layer (39) of the present invention is removed in the process of manufacturing the mask (FIG 4) and is not a supporting member of the mask pattern.

To the examiner, the fabrication process of Hoya appears to be essentially the same as that of applicant's and applicant's etching stop layer (39) appears to be a supporting member of the mask blank just as much as Hoya's layer 55. Below, applicant's FIG.3(a) - FIG. 3(e) are shown beside Hoya's FIG.15A - FIG.15E.



The only discernable difference is between FIG.3(e) and FIG.15E wherein applicant's layer (39) is not shown on the sidewalls of opening (36), whereas Hoya's layer 55 is shown to be deposited on the sidewalls. In this regard the examiner notes that applicant's specification, page 15, lines 21-28, states:

> The etching stop layer 39 is also formed on the bottoms of the supporting silicon layer 37 at the same time of the formation inside the opening 36. Depending on the kind of film deposition method, the etching stop layer 39 is also formed on the sides of the supporting silicon layer 37. But the formed layer on the sides of the supporting silicon layer 37 does not affect the characteristics of the mask blank 40 and the fabrication process of the mask.

As such, there does not appear to be any significant distinction between applicant's layer (39) and Hoya's layer (55).

Regarding the rejection being made in the alternative under 102/103, the examiner notes that one circumstance under which a rejection in the alternative under 102/103 is appropriate is:

> *When the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention but has basis for shifting the burden of proof to applicant as in In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). See MPEP § § 2112- 2112.02.*

In this circumstance, the examiner's basis for shifting the burden of proof to applicant stems from the fact that applicant's specification provides no more detail regarding the manner in which applicant's layer (39) is provided than does Hoya with respect layer (55).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M, W and F: 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Allan Olsen
Primary Examiner
Art Unit 1763